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Creation of a Summation Formula Attached with Recurrence Relation and Hypergeometric Function

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Strictly as per the compliance and regulations of:





Creation of a Summation Formula Attached with Recurrence Relation and Hypergeometric Function

Jai Bhagwan^α & Salahuddin^σ

Abstract- The main aim of present paper is the creation of a summation formula attached with recurrence relation and Hypergeometric function. We have used computational method using Mathematical.

I. INTRODUCTION

a) Generalized Hypergeometric Functions

A generalized hypergeometric function ${}_pF_q(a_1, \dots, a_p; b_1, \dots, b_q; z)$ is a function which can be defined in the form of a hypergeometric series, i.e., a series for which the ratio of successive terms can be written

$$\frac{c_{k+1}}{c_k} = \frac{P(k)}{Q(k)} = \frac{(k+a_1)(k+a_2)\dots(k+a_p)}{(k+b_1)(k+b_2)\dots(k+b_q)(k+1)} z. \quad (1)$$

Where $k+1$ in the denominator is present for historical reasons of notation [Koepe p.12(2.9)], and the resulting generalized hypergeometric function is written

$${}_pF_q \left[\begin{matrix} a_1, a_2, \dots, a_p & ; \\ b_1, b_2, \dots, b_q & ; \end{matrix} \quad z \right] = \sum_{k=0}^{\infty} \frac{(a_1)_k (a_2)_k \dots (a_p)_k z^k}{(b_1)_k (b_2)_k \dots (b_q)_k k!} \quad (2)$$

or

$${}_pF_q \left[\begin{matrix} (a_p) & ; \\ (b_q) & ; \end{matrix} \quad z \right] = \sum_{k=0}^{\infty} \frac{((a_p))_k z^k}{((b_q))_k k!} \quad (3)$$

where the parameters $b_1, b_2, \dots, b_q$ are positive integers.

The ${}_pF_q$ series converges for all finite z if $p \leq q$, converges for $|z| < 1$ if $p = q + 1$, diverges for all $z, z \neq 0$ if $p > q + 1$ [Luke p.156(3)].

The function ${}_2F_1(a, b; c; z)$ corresponding to $p = 2, q = 1$, is the first hypergeometric function to be studied (and, in general, arises the most frequently in physical problems), and so is frequently known as "the" hypergeometric equation or, more explicitly, Gauss's hypergeometric function [Gauss p.123-162]. To confuse matters even more, the term "hypergeometric function" is less commonly used to mean closed form, and "hypergeometric series" is sometimes used to mean hypergeometric function.

The hypergeometric functions are solutions of Gaussian hypergeometric linear differential equation of second order

$$z(1-z)y'' + [c - (a+b+1)z]y' - aby = 0 \quad (4)$$

The solution of this equation is

$$y = A_0 \left[1 + \frac{ab}{1!c}z + \frac{a(a+1)b(b+1)}{2!c(c+1)}z^2 + \dots \right] \quad (5)$$

This is the so-called regular solution, denoted

$${}_2F_1(a, b; c; z) = \left[1 + \frac{ab}{1!c}z + \frac{a(a+1)b(b+1)}{2!c(c+1)}z^2 + \dots \right] = \sum_{k=0}^{\infty} \frac{(a)_k (b)_k z^k}{(c)_k k!} \quad (6)$$

which converges if c is not a negative integer for all $|z| < 1$ and on the unit circle $|z| = 1$ if $R(c-a-b) > 0$.

It is known as Gauss hypergeometric function in terms of Pochhammer symbol $(a)_k$ or generalized factorial function.

Many of the common mathematical functions can be expressed in terms of the hypergeometric function. Some typical examples are

$$(1-z)^{-a} = z {}_2F_1(1, 1; 2; -z) \quad (7)$$

$$\sin^{-1} z = z {}_2F_1\left(\frac{1}{2}, \frac{1}{2}; \frac{3}{2}; z^2\right) \quad (8)$$

b) Gauss' Relations For Contiguous Functions

The six functions $F(a \pm 1, b; c; z)$, $F(a, b \pm 1; c; z)$, $F(a, b; c \pm 1; z)$ are called contiguous to $F(a, b; c; z)$. Relation between $F(a, b; c; z)$ and any two contiguous functions have been given by Gauss.

[Abramowitz p.558(15.2.19)]

$$(a-b)(1-z) {}_2F_1\left[\begin{matrix} a, b \\ c \end{matrix}; z\right] = (c-b) {}_2F_1\left[\begin{matrix} a, b-1 \\ c \end{matrix}; z\right] + (a-c) {}_2F_1\left[\begin{matrix} a-1, b \\ c \end{matrix}; z\right] \quad (9)$$

c) Recurrence Relation

In mathematics, a recurrence relation is an equation that recursively defines a sequence, once one or more initial terms are given: each further term of the sequence is defined as a function of the preceding terms. The recurrence relation of Gamma function is defined by [Temme p.42(3.1.1)]

$$\Gamma(z+1) = z \Gamma(z) \quad (10)$$

d) Legendre's Duplication Formula

Following Bells and Wong [p.26(2.3.1)], we have

$$\sqrt{\pi} \Gamma(2z) = 2^{(2z-1)} \Gamma(z) \Gamma\left(z + \frac{1}{2}\right) \quad (11)$$

$$\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi} = \frac{2^{(b-1)} \Gamma\left(\frac{b}{2}\right) \Gamma\left(\frac{b+1}{2}\right)}{\Gamma(b)} \quad (12)$$

$$= \frac{2^{(a-1)} \Gamma(\frac{a}{2}) \Gamma(\frac{a+1}{2})}{\Gamma(a)} \quad (13)$$

Following Prudnikov, Brychkov & Marichev [p.491.(7.3.7.3)], we have

$${}_2F_1 \left[\begin{matrix} a, b ; \\ \frac{a+b-1}{2} ; \end{matrix} \frac{1}{2} \right] = \sqrt{\pi} \left[\frac{\Gamma(\frac{a+b+1}{2})}{\Gamma(\frac{a+1}{2})\Gamma(\frac{b+1}{2})} + \frac{2 \Gamma(\frac{a+b-1}{2})}{\Gamma(a)\Gamma(b)} \right] \quad (14)$$

Now using Legendre's duplication formula and Recurrence relation for Gamma function, the above formula can be written in the form

$${}_2F_1 \left[\begin{matrix} a, b ; \\ \frac{a+b-1}{2} ; \end{matrix} \frac{1}{2} \right] = \frac{2^{(b-1)} \Gamma(\frac{a+b-1}{2})}{\Gamma(b)} \left[\frac{\Gamma(\frac{b}{2})}{\Gamma(\frac{a-1}{2})} + \frac{2^{(a-b+1)} \Gamma(\frac{a}{2}) \Gamma(\frac{a+1}{2})}{\{\Gamma(a)\}^2} + \frac{\Gamma(\frac{b+2}{2})}{\Gamma(\frac{a+1}{2})} \right] \quad (15)$$

It is noted that the above formula [Prudnikov,491.(7.3.7.3)], i.e. equation(14) or (15) is not correct.The correct form of equation(14) or (15) is obtained by [Asish et. al(2008), p.337(10)]

$${}_2F_1 \left[\begin{matrix} a, b ; \\ \frac{a+b-1}{2} ; \end{matrix} \frac{1}{2} \right] = \frac{2^{(b-1)} \Gamma(\frac{a+b-1}{2})}{\Gamma(b)} \left[\frac{\Gamma(\frac{b}{2})}{\Gamma(\frac{a-1}{2})} \left\{ \frac{(b+a-1)}{(a-1)} \right\} + \frac{2 \Gamma(\frac{b+1}{2})}{\Gamma(\frac{a}{2})} \right] \quad (16)$$

Involving the derived formula obtained by [Salahuddin,p .45(9)], we establish the main formula.

II. MAIN SUMMATION FORMULA

For the main formula $a \neq b$

For $a < 1$ and $a > 30$

$$\begin{aligned} {}_2F_1 \left[\begin{matrix} a, b ; \\ \frac{a+b-30}{2} ; \end{matrix} \frac{1}{2} \right] &= \frac{2^{(b-1)} \Gamma(\frac{a+b-30}{2})}{(a-b)\Gamma(b)} \left[\frac{\Gamma(\frac{b+1}{2})}{\Gamma(\frac{a-29}{2})} \left\{ \frac{(-42849873690624000a)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \right. \right. \\ &+ \frac{(102174938785382400a^2 - 90168185255362560a^3 + 48238440075952128a^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ &+ \frac{(-14222757092524032a^5 + 3434748504629248a^6 - 476013869035520a^7 + 63240546512640a^8)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ &+ \frac{(-4603989262336a^9 + 362770106624a^{10} - 14085527040a^{11} + 665833376a^{12} - 12792832a^{13})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ &+ \frac{(343728a^{14} - 2480a^{15} + 31a^{16} + 42849873690624000b - 31082092167168000ab)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ &+ \left. \frac{(-73098173806018560a^2b + 108868047825272832a^3b - 57797146289504256a^4b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} \right] \end{aligned}$$



$$\begin{aligned}
 & + \frac{(22066910445879296a^5b - 4278218966429696a^6b + 807376117319680a^7b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-74955432767488a^8b + 8169315368448a^9b - 385635936768a^{10}b + 25593453184a^{11}b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-582589696a^{12}b + 23404256a^{13}b - 198896a^{14}b + 4464a^{15}b - 71092846618214400b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(112755981161594880ab^2 - 36482063700197376a^2b^2 - 29343138531508224a^3b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(30395328111255552a^4b^2 - 10197276680204288a^5b^2 + 2946095411127296a^6b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-374548696047616a^7b^2 + 56962219478272a^8b^2 - 3393695599104a^9b^2 + 308716484928a^{10}b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-8514867712a^{11}b^2 + 480008464a^{12}b^2 - 4847408a^{13}b^2 + 165416a^{14}b^2 + 50510377899786240b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-99910969798164480ab^3 + 54967053635026944a^2b^3 - 10666441061793792a^3b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-4166767625613312a^4b^3 + 3206675295074304a^5b^3 - 686051126108160a^6b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(156167659677696a^7b^3 - 12540657489408a^8b^3 + 1572782347392a^9b^3 - 54323189760a^{10}b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(4180393152a^{11}b^3 - 51048816a^{12}b^3 + 2459664a^{13}b^3 - 20713454402863104b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(40852434546720768ab^4 - 32041240778039296a^2b^4 + 8698430393331712a^3b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-1154676393076224a^4b^4 - 247159742668800a^5b^4 + 147864940085760a^6b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-19581576698880a^7b^4 + 3617566362720a^8b^4 - 166428633600a^9b^4 + 17522948400a^{10}b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(-266463600a^{11}b^4 + 17530500a^{12}b^4 + 5543553731788800b^5 - 12155400984281088ab^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(8180404586819584a^2b^5 - 3671679306500096a^3b^5 + 552177907875840a^4b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-54103342402560a^5b^5 - 6502833792000a^6b^5 + 3126362400000a^7b^5 - 233673258240a^8b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(35839030560a^9b^5 - 719559600a^{10}b^5 + 64512240a^{11}b^5 - 1033904237649920b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(2099766917263360ab^6 - 1867829847333888a^2b^6 + 595797693046784a^3b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-178743343074816a^4b^6 + 15207496657920a^5b^6 - 1156337239680a^6b^6 - 73365304320a^7b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(29075170320a^8b^6 - 937908720a^9b^6 + 121580760a^{10}b^6 + 139675243868160b^7)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-315216253958144ab^7 + 210439757914112a^2b^7 - 108338835331072a^3b^7)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(17944242066432a^4b^7 - 3924412035840a^5b^7 + 177220085760a^6b^7 - 10838056320a^7b^7)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-282861360a^8b^7 + 94287120a^9b^7 - 13985569165568b^8 + 27853051633664ab^8)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-25906772757248a^2b^8 + 7697887351296a^3b^8 - 2669359676832a^4b^8 + 222457190400a^5b^8)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-37501461360a^6b^8 + 699709680a^7b^8 - 35357670a^8b^8 + 1050576384000b^9)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-2375213023744ab^9 + 1454416768512a^2b^9 - 790386876288a^3b^9 + 108636023040a^4b^9)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-27632383200a^5b^9 + 918058800a^6b^9 - 124062000a^7b^9 - 59398127360b^{10})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(111928327680ab^{10} - 105528303296a^2b^{10} + 25592473088a^3b^{10} - 9433933392a^4b^{10})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(490854000a^5b^{10} - 96768360a^6b^{10} + 2513871360b^{11} - 5584355712ab^{11} + 2860642304a^2b^{11})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-1587936064a^3b^{11} + 134073264a^4b^{11} - 36463440a^5b^{11} - 78393952b^{12} + 132474368ab^{12})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-123782256a^2b^{12} + 18886192a^3b^{12} - 7152444a^4b^{12} + 1747200b^{13} - 3719968ab^{13})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-704816a^3b^{13} - 26320b^{14} + 34480ab^{14} - 31000a^2b^{14} + 240b^{15} - 464ab^{15} - b^{16})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} \Bigg\} + \\
 & + \frac{\Gamma(\frac{b}{2})}{\Gamma(\frac{a-30}{2})} \left\{ \frac{(-42849873690624000a + 71092846618214400a^2 - 50510377899786240a^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \right. \\
 & + \frac{(20713454402863104a^4 - 5543553731788800a^5 + 1033904237649920a^6 - 139675243868160a^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(13985569165568a^8 - 1050576384000a^9 + 59398127360a^{10} - 2513871360a^{11} + 78393952a^{12})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-1747200a^{13} + 26320a^{14} - 240a^{15} + a^{16} + 42849873690624000b + 31082092167168000ab)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-112755981161594880a^2b + 99910969798164480a^3b - 40852434546720768a^4b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(12155400984281088a^5b - 2099766917263360a^6b + 315216253958144a^7b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-27853051633664a^8b + 2375213023744a^9b - 111928327680a^{10}b + 5584355712a^{11}b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-132474368a^{12}b + 3719968a^{13}b - 34480a^{14}b + 464a^{15}b - 102174938785382400b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(73098173806018560ab^2 + 36482063700197376a^2b^2 - 54967053635026944a^3b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(32041240778039296a^4b^2 - 8180404586819584a^5b^2 + 1867829847333888a^6b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-210439757914112a^7b^2 + 25906772757248a^8b^2 - 1454416768512a^9b^2 + 105528303296a^{10}b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-2860642304a^{11}b^2 + 123782256a^{12}b^2 - 1274224a^{13}b^2 + 31000a^{14}b^2 + 90168185255362560b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-108868047825272832ab^3 + 29343138531508224a^2b^3 + 10666441061793792a^3b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-8698430393331712a^4b^3 + 3671679306500096a^5b^3 - 595797693046784a^6b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(108338835331072a^7b^3 - 7697887351296a^8b^3 + 790386876288a^9b^3 - 25592473088a^{10}b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(1587936064a^{11}b^3 - 18886192a^{12}b^3 + 704816a^{13}b^3 - 48238440075952128b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(57797146289504256ab^4 - 30395328111255552a^2b^4 + 4166767625613312a^3b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(1154676393076224a^4b^4 - 552177907875840a^5b^4 + 178743343074816a^6b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-17944242066432a^7b^4 + 2669359676832a^8b^4 - 108636023040a^9b^4 + 9433933392a^{10}b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-134073264a^{11}b^4 + 7152444a^{12}b^4 + 14222757092524032b^5 - 22066910445879296ab^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(10197276680204288a^2b^5 - 3206675295074304a^3b^5 + 247159742668800a^4b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(54103342402560a^5b^5 - 15207496657920a^6b^5 + 3924412035840a^7b^5 - 222457190400a^8b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(27632383200a^9b^5 - 490854000a^{10}b^5 + 36463440a^{11}b^5 - 3434748504629248b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(4278218966429696ab^6 - 2946095411127296a^2b^6 + 686051126108160a^3b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-147864940085760a^4b^6 + 6502833792000a^5b^6 + 1156337239680a^6b^6 - 177220085760a^7b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(37501461360a^8b^6 - 918058800a^9b^6 + 96768360a^{10}b^6 + 476013869035520b^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-807376117319680ab^7 + 374548696047616a^2b^7 - 156167659677696a^3b^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(19581576698880a^4b^7 - 3126362400000a^5b^7 + 73365304320a^6b^7 + 10838056320a^7b^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-699709680a^8b^7 + 124062000a^9b^7 - 63240546512640b^8 + 74955432767488ab^8)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-56962219478272a^2b^8 + 12540657489408a^3b^8 - 3617566362720a^4b^8 + 233673258240a^5b^8)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-29075170320a^6b^8 + 282861360a^7b^8 + 35357670a^8b^8 + 4603989262336b^9)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-8169315368448ab^9 + 3393695599104a^2b^9 - 1572782347392a^3b^9 + 166428633600a^4b^9)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-35839030560a^5b^9 + 937908720a^6b^9 - 94287120a^7b^9 - 362770106624b^{10})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(385635936768ab^{10} - 308716484928a^2b^{10} + 54323189760a^3b^{10} - 17522948400a^4b^{10})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(719559600a^5b^{10} - 121580760a^6b^{10} + 14085527040b^{11} - 25593453184ab^{11} + 8514867712a^2b^{11})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-4180393152a^3b^{11} + 266463600a^4b^{11} - 64512240a^5b^{11} - 665833376b^{12} + 582589696ab^{12})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-480008464a^2b^{12} + 51048816a^3b^{12} - 17530500a^4b^{12} + 12792832b^{13} - 23404256ab^{13})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$+ \frac{(4847408a^2b^{13} - 2459664a^3b^{13} - 343728b^{14} + 198896ab^{14} - 165416a^2b^{14} + 2480b^{15})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \left. + \frac{(-4464ab^{15} - 31b^{16})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} \right\} \quad (17)$$

III. EVALUATION OF MAIN SUMMATION FORMULA

Substituting $c = \frac{a+b-30}{2}$ and $z = \frac{1}{2}$ in equation (24), we get

$$(a-b) {}_2F_1 \left[\begin{matrix} a, b \\ \frac{a+b-30}{2} \end{matrix}; \frac{1}{2} \right] = (a-b-30) {}_2F_1 \left[\begin{matrix} a, b-1 \\ \frac{a+b-30}{2} \end{matrix}; \frac{1}{2} \right] + (a-b+30) {}_2F_1 \left[\begin{matrix} a-1, b \\ \frac{a+b-30}{2} \end{matrix}; \frac{1}{2} \right]$$

Now involving the the formula obtained by salahuddin[Salahuddin,p .45(9)], we get

$$\begin{aligned} L.H.S = & \frac{2^{(b-1)} \Gamma(\frac{a+b-30}{2})}{\Gamma(b)} \left[\frac{(a-b-30)}{(a-b+1)} \frac{\Gamma(\frac{b+1}{2})}{\Gamma(\frac{a-29}{2})} \left\{ \frac{(-42849873690624000)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \right. \right. \\ & + \frac{(56468406848716800a + 10090943081349120a^2 - 45646821227298816a^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ & + \frac{(30119994532429824a^4 - 10659242374635520a^5 + 2384177957457920a^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ & + \frac{(-372420039991552a^7 + 41100528816128a^8 - 3372406380160a^9 + 199271883200a^{10})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ & + \frac{(-8841030848a^{11} + 271930672a^{12} - 6056120a^{13} + 80260a^{14} - 659a^{15} + a^{16})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ & + \frac{(113942720308838400b - 192432640779878400ab + 71179471376547840a^2b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ & + \frac{(31565349178638336a^3b - 35990351353896960a^4b + 14307315699220480a^5b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ & + \frac{(-3391367994865920a^6b + 532460361363712a^7b - 59560797031680a^8b + 4745684818240a^9b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\ & + \frac{(-279195240480a^{10}b + 11619237968a^{11}b - 349449360a^{12}b + 6800780a^{13}b - 84165a^{14}b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \end{aligned}$$

$$\begin{aligned}
 & + \frac{(434a^{15}b - 121603224518000640b^2 + 229663329314734080ab^2 - 132562310349127680a^2b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(17716361173647360a^3b^2 + 12817606114037760a^4b^2 - 7268501921936640a^5b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(1903248210151680a^6b^2 - 309340014067200a^7b^2 + 34669345543680a^8b^2 - 2718132397440a^9b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(154142180400a^{10}b^2 - 6044516400a^{11}b^2 + 166890360a^{12}b^2 - 2737455a^{13}b^2 + 26970a^{14}b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(71223832302649344b^3 - 142411269625675776ab^3 + 96502735620096000a^2b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-27158505721528320a^3b^3 + 1046052696318720a^4b^3 + 1645411005646080a^5b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-540144838041600a^6b^3 + 97422347546880a^7b^3 - 10689025278240a^8b^3 + 855046307760a^9b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-43587835200a^{10}b^3 + 1695549960a^{11}b^3 - 35236305a^{12}b^3 + 566370a^{13}b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-26257008134651904b^4 + 54170505981911040ab^4 - 39455725614796800a^2b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(13679204053597440a^3b^4 - 2120890334688000a^4b^4 - 19025526931200a^5b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(84920244816000a^6b^4 - 16677013852800a^7b^4 + 2116502035200a^8b^4 - 145414149000a^9b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(8158694700a^{10}b^4 - 212995575a^{11}b^4 + 5259150a^{12}b^4 + 6577457969438720b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-13820286467276800ab^5 + 10393670565008640a^2b^5 - 3918081302580480a^3b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(791845793625600a^4b^5 - 69492783427200a^5b^5 - 2483999138880a^6b^5 + 1910624274720a^7b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(-212369331600a^8b^5 + 19049720100a^9b^5 - 641090385a^{10}b^5 + 24192090a^{11}b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-1173579481518080b^6 + 2469322022918400ab^6 - 1911816899339520a^2b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(732192289313280a^3b^6 - 163543093881600a^4b^6 + 20082084664320a^5b^6 - 941035082400a^6b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-48979677600a^7b^6 + 18237114000a^8b^6 - 901000275a^9b^6 + 56448210a^{10}b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(153660813033728b^7 - 326583853541632ab^7 + 245643692083200a^2b^7 - 99106124778240a^3b^7)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(21459053764800a^4b^7 - 3012890332320a^5b^7 + 216761126400a^6b^7 - 4242920400a^7b^7)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-265182525a^8b^7 + 58929450a^9b^7 - 15036145549568b^8 + 31156475560320ab^8)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-24451722638400a^2b^8 + 8940052710720a^3b^8 - 2152280437200a^4b^8 + 260046358200a^5b^8)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-23317452900a^6b^8 + 795547575a^7b^8 + 1109974511360b^9 - 2340242526400ab^9)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(1645789231200a^2b^9 - 673510158960a^3b^9 + 125836626000a^4b^9 - 19235813100a^5b^9)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(1052976225a^6b^9 - 58929450a^7b^9 - 61911998720b^{10} + 122169740160ab^{10})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-95144334480a^2b^{10} + 29274532560a^3b^{10} - 7159456200a^4b^{10} + 568514115a^5b^{10})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-56448210a^6b^{10} + 2592265312b^{11} - 5337467408ab^{11} + 3197563200a^2b^{11} - 1300061880a^3b^{11})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(155144925a^4b^{11} - 24192090a^5b^{11} - 80141152b^{12} + 142613640ab^{12})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(-108689100a^2b^{12} + 21562515a^3b^{12} - 5259150a^4b^{12} + 1773520b^{13} - 3493700ab^{13})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(1415925a^2b^{13} - 566370a^3b^{13} - 26560b^{14} + 36735ab^{14} - 26970a^2b^{14} + 241b^{15})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-434ab^{15} - b^{16})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} \left\} + \frac{(a - b - 30)(b - 1)}{(a - b + 1)} \frac{\Gamma(\frac{b}{2})}{\Gamma(\frac{a-30}{2})} \left\{ \frac{(42849873690624000)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \right. \\
 & + \frac{(-26814643804569600a - 21476290178580480a^2 + 29081047157637120a^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-14200532432486400a^4 + 4036298413056000a^5 - 759685713346560a^6 + 100366817591040a^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-9589432195200a^8 + 671530516800a^9 - 34499905440a^{10} + 1285480560a^{11} - 33797400a^{12})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(594300a^{13} - 6270a^{14} + 30a^{15} - 100746609662361600b + 105369623089643520ab)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-18497359471509504a^2b - 19697219949428736a^3b + 13886382286397440a^4b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-4339068030189568a^5b + 857574469125888a^6b - 113217893178368a^7b + 10859483768000a^8b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-731396205504a^9b + 36817157936a^{10}b - 1257372896a^{11}b + 31361460a^{12}b - 443548a^{13}b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(4030a^{14}b + 92490335838535680b^2 - 113987664871096320ab^2 + 46383618741829632a^2b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-1926305147437056a^3b^2 - 4380147255427072a^4b^2 + 1878105598159616a^5b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-386934853266944a^6b^2 + 54537090886912a^7b^2 - 4938029127456a^8b^2 + 342285504528a^9b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-15032099888a^{10}b^2 + 523484104a^{11}b^2 - 9419722a^{12}b^2 + 138446a^{13}b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(-46632165832065024b^3 + 62163571923615744ab^3 - 30822099684507648a^2b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(6525530932051968a^3b^3 + 131032468218624a^4b^3 - 348720370467840a^5b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(98495967926016a^6b^3 - 13207757720832a^7b^3 + 1340626529232a^8b^3 - 76951667040a^9b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(3775087992a^{10}b^3 - 84987864a^{11}b^3 + 1893294a^{12}b^3 + 14859663097823232b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-20711447922302976ab^4 + 11169873454153728a^2b^4 - 2983163756323584a^3b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(363675061996800a^4b^4 + 20359470898560a^5b^4 - 11353733939520a^6b^4 + 2209706471520a^7b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-178725335400a^8b^4 + 13011676500a^9b^4 - 369893550a^{10}b^4 + 12271350a^{11}b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-3271193580412928b^5 + 4569102979137536ab^5 - 2610314589022976a^2b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(753958524042240a^3b^5 - 120686089584000a^4b^5 + 8674613539200a^5b^5 + 705515781600a^6b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-150958641600a^7b^5 + 20749369500a^8b^5 - 787793700a^9b^5 + 40320150a^{10}b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(505025512816640b^6 - 733037562791680ab^6 + 405911801172480a^2b^6 - 127441219311360a^3b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(21411848928960a^4b^6 - 2132804429280a^5b^6 + 86079178080a^6b^6 + 8858026800a^7b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-664352010a^8b^6 + 65132550a^9b^6 - 59551759843072b^7 + 81170061386752ab^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-48474589768960a^2b^7 + 13733274514176a^3b^7 - 2650892519520a^4b^7 + 253026930240a^5b^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(-15527599920a^6b^7 + 282861360a^7b^7 + 35357670a^8b^7 + 4947215345536b^8)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-7286981375168ab^8 + 3740645877984a^2b^8 - 1232794859472a^3b^8 + 183751464600a^4b^8)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-22893160860a^5b^8 + 1003041270a^6b^8 - 35357670a^7b^8 - 339191763264b^9 + 424211354688ab^9)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-257569498128a^2b^9 + 60858560160a^3b^9 - 12407548500a^4b^9 + 800199900a^5b^9)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-65132550a^6b^9 + 15279519840b^{10} - 22632383280ab^{10} + 9573055440a^2b^{10})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-3218599800a^3b^{10} + 303277650a^4b^{10} - 40320150a^5b^{10} - 621837424b^{11} + 649171744ab^{11})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-397825480a^2b^{11} + 58621992a^3b^{11} - 12271350a^4b^{11} + 13939432b^{12} - 20735156ab^{12})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(5539638a^2b^{12} - 1893294a^3b^{12} - 323708b^{13} + 223076ab^{13} - 138446a^2b^{13} + 2690b^{14})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \left. \frac{(-4030ab^{14} - 30b^{15})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} \right\} + \frac{2^{(b-1)} \Gamma(\frac{a+b-30}{2})}{\Gamma(b)} \left[\frac{(a-b+30)}{(a-b-1)} \frac{\Gamma(\frac{b}{2})}{\Gamma(\frac{a-30}{2})} \times \right. \\
 & + \frac{(42849873690624000 - 113942720308838400a + 121603224518000640a^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-71223832302649344a^3 + 26257008134651904a^4 - 6577457969438720a^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(1173579481518080a^6 - 153660813033728a^7 + 15036145549568a^8 - 1109974511360a^9)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(61911998720a^{10} - 2592265312a^{11} + 80141152a^{12} - 1773520a^{13} + 26560a^{14} - 241a^{15} + a^{16})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-56468406848716800b + 192432640779878400ab - 229663329314734080a^2b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(142411269625675776a^3b - 54170505981911040a^4b + 13820286467276800a^5b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-2469322022918400a^6b + 326583853541632a^7b - 31156475560320a^8b + 2340242526400a^9b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-122169740160a^{10}b + 5337467408a^{11}b - 142613640a^{12}b + 3493700a^{13}b - 36735a^{14}b)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(434a^{15}b - 10090943081349120b^2 - 71179471376547840ab^2 + 132562310349127680a^2b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-96502735620096000a^3b^2 + 39455725614796800a^4b^2 - 10393670565008640a^5b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(1911816899339520a^6b^2 - 245643692083200a^7b^2 + 24451722638400a^8b^2 - 1645789231200a^9b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(95144334480a^{10}b^2 - 3197563200a^{11}b^2 + 108689100a^{12}b^2 - 1415925a^{13}b^2 + 26970a^{14}b^2)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(45646821227298816b^3 - 31565349178638336ab^3 - 17716361173647360a^2b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(27158505721528320a^3b^3 - 13679204053597440a^4b^3 + 3918081302580480a^5b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-732192289313280a^6b^3 + 99106124778240a^7b^3 - 8940052710720a^8b^3 + 673510158960a^9b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-29274532560a^{10}b^3 + 1300061880a^{11}b^3 - 21562515a^{12}b^3 + 566370a^{13}b^3)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-30119994532429824b^4 + 35990351353896960ab^4 - 12817606114037760a^2b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-1046052696318720a^3b^4 + 2120890334688000a^4b^4 - 791845793625600a^5b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(163543093881600a^6b^4 - 21459053764800a^7b^4 + 2152280437200a^8b^4 - 125836626000a^9b^4)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(7159456200a^{10}b^4 - 155144925a^{11}b^4 + 5259150a^{12}b^4 + 10659242374635520b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-14307315699220480ab^5 + 7268501921936640a^2b^5 - 1645411005646080a^3b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(19025526931200a^4b^5 + 69492783427200a^5b^5 - 20082084664320a^6b^5 + 3012890332320a^7b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-260046358200a^8b^5 + 19235813100a^9b^5 - 568514115a^{10}b^5 + 24192090a^{11}b^5)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-2384177957457920b^6 + 3391367994865920ab^6 - 1903248210151680a^2b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(540144838041600a^3b^6 - 84920244816000a^4b^6 + 2483999138880a^5b^6 + 941035082400a^6b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-216761126400a^7b^6 + 23317452900a^8b^6 - 1052976225a^9b^6 + 56448210a^{10}b^6)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(372420039991552b^7 - 532460361363712ab^7 + 309340014067200a^2b^7 - 97422347546880a^3b^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(16677013852800a^4b^7 - 1910624274720a^5b^7 + 48979677600a^6b^7 + 4242920400a^7b^7)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-795547575a^8b^7 + 58929450a^9b^7 - 41100528816128b^8 + 59560797031680ab^8)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-34669345543680a^2b^8 + 10689025278240a^3b^8 - 2116502035200a^4b^8 + 212369331600a^5b^8)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-18237114000a^6b^8 + 265182525a^7b^8 + 3372406380160b^9 - 4745684818240ab^9)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(2718132397440a^2b^9 - 855046307760a^3b^9 + 145414149000a^4b^9 - 19049720100a^5b^9)}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(901000275a^6b^9 - 58929450a^7b^9 - 199271883200b^{10} + 279195240480ab^{10})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(-154142180400a^2b^{10} + 43587835200a^3b^{10} - 8158694700a^4b^{10} + 641090385a^5b^{10})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-56448210a^6b^{10} + 8841030848b^{11} - 11619237968ab^{11} + 6044516400a^2b^{11} - 1695549960a^3b^{11})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(212995575a^4b^{11} - 24192090a^5b^{11} - 271930672b^{12} + 349449360ab^{12} - 166890360a^2b^{12})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(35236305a^3b^{12} - 5259150a^4b^{12} + 6056120b^{13} - 6800780ab^{13} + 2737455a^2b^{13} - 566370a^3b^{13})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \\
 & + \frac{(-80260b^{14} + 84165ab^{14} - 26970a^2b^{14} + 659b^{15} - 434ab^{15} - b^{16})}{\prod_{\eta=1}^{15} \{a - 2\eta\}} + \frac{(a - b + 30)}{(a - b - 1)} \frac{\Gamma(\frac{b+1}{2})}{\Gamma(\frac{a-29}{2})} \times \\
 & \times \left\{ \frac{(-42849873690624000 + 100746609662361600a - 92490335838535680a^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \right. \\
 & + \frac{(46632165832065024a^3 - 14859663097823232a^4 + 3271193580412928a^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-505025512816640a^6 + 59551759843072a^7 - 4947215345536a^8 + 339191763264a^9)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-15279519840a^{10} + 621837424a^{11} - 13939432a^{12} + 323708a^{13} - 2690a^{14} + 30a^{15})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(26814643804569600b - 105369623089643520ab + 113987664871096320a^2b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-62163571923615744a^3b + 20711447922302976a^4b - 4569102979137536a^5b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(733037562791680a^6b - 81170061386752a^7b + 7286981375168a^8b - 424211354688a^9b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(22632383280a^{10}b - 649171744a^{11}b + 20735156a^{12}b - 223076a^{13}b + 4030a^{14}b)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(21476290178580480b^2 + 18497359471509504ab^2 - 46383618741829632a^2b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(30822099684507648a^3b^2 - 11169873454153728a^4b^2 + 2610314589022976a^5b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-405911801172480a^6b^2 + 48474589768960a^7b^2 - 3740645877984a^8b^2 + 257569498128a^9b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-9573055440a^{10}b^2 + 397825480a^{11}b^2 - 5539638a^{12}b^2 + 138446a^{13}b^2)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-29081047157637120b^3 + 19697219949428736ab^3 + 1926305147437056a^2b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-6525530932051968a^3b^3 + 2983163756323584a^4b^3 - 753958524042240a^5b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(127441219311360a^6b^3 - 13733274514176a^7b^3 + 1232794859472a^8b^3 - 60858560160a^9b^3)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(3218599800a^{10}b^3 - 58621992a^{11}b^3 + 1893294a^{12}b^3 + 14200532432486400b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-13886382286397440ab^4 + 4380147255427072a^2b^4 - 131032468218624a^3b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-363675061996800a^4b^4 + 120686089584000a^5b^4 - 21411848928960a^6b^4 + 2650892519520a^7b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-183751464600a^8b^4 + 12407548500a^9b^4 - 303277650a^{10}b^4 + 12271350a^{11}b^4)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-4036298413056000b^5 + 4339068030189568ab^5 - 1878105598159616a^2b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(348720370467840a^3b^5 - 20359470898560a^4b^5 - 8674613539200a^5b^5 + 2132804429280a^6b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-253026930240a^7b^5 + 22893160860a^8b^5 - 800199900a^9b^5 + 40320150a^{10}b^5)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(759685713346560b^6 - 857574469125888ab^6 + 386934853266944a^2b^6 - 98495967926016a^3b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} +
 \end{aligned}$$

$$\begin{aligned}
 & + \frac{(+11353733939520a^4b^6 - 705515781600a^5b^6 - 86079178080a^6b^6 + 15527599920a^7b^6)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-1003041270a^8b^6 + 65132550a^9b^6 - 100366817591040b^7 + 113217893178368ab^7)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-54537090886912a^2b^7 + 13207757720832a^3b^7 - 2209706471520a^4b^7 + 150958641600a^5b^7)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-8858026800a^6b^7 - 282861360a^7b^7 + 35357670a^8b^7 + 9589432195200b^8 - 10859483768000ab^8)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(4938029127456a^2b^8 - 1340626529232a^3b^8 + 178725335400a^4b^8 - 20749369500a^5b^8)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(664352010a^6b^8 - 35357670a^7b^8 - 671530516800b^9 + 731396205504ab^9 - 342285504528a^2b^9)}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(76951667040a^3b^9 - 13011676500a^4b^9 + 787793700a^5b^9 - 65132550a^6b^9 + 34499905440b^{10})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-36817157936ab^{10} + 15032099888a^2b^{10} - 3775087992a^3b^{10} + 369893550a^4b^{10})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-40320150a^5b^{10} - 1285480560b^{11} + 1257372896ab^{11} - 523484104a^2b^{11} + 84987864a^3b^{11})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(-12271350a^4b^{11} + 33797400b^{12} - 31361460ab^{12} + 9419722a^2b^{12} - 1893294a^3b^{12} - 594300b^{13})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} + \\
 & + \frac{(443548ab^{13} - 138446a^2b^{13} + 6270b^{14} - 4030ab^{14} - 30b^{15})}{\prod_{\zeta=1}^{15} \{a - (2\zeta - 1)\}} \Bigg\}
 \end{aligned}$$

In this way, we get the main formula.

IV. CONCLUSION

In this paper we have derived a summation formula with the help of contiguous relation . However, the formula presented herein may be further developed to extend this result .Thus we can only hope that the development presented in this work will stimulate further interest and research in this important area of classical special functions. Just as the mathematical properties of the Gauss hypergeometric function are already of immense and significant utility in mathematical sciences and numerous other areas of pure and applied mathematics, the elucidation and discovery of the formula of hyperge-

ometric functions considered herein should certainly eventually prove useful to further developments in the broad areas alluded to above.

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